

**Actuarial Society of South Africa**

May 2018

**Subject A301 — Actuarial Risk Management**

**PAPER ONE**

**EXAMINERS' REPORT**

*This subject report has been written with the aim of helping candidates. This report summarises the main points that the examiners were looking for and some common problems encountered.*

## GENERAL COMMENTS

*This paper was much more poorly handled by students than Paper 2.*

## QUESTION 1

*Examiner's comments:*

*This was a straight bookwork question and was therefore reasonably well answered by well-prepared candidates*

### Meeting policy objectives – controlling economic growth

Low real interest rates encourage investment spending by firms and increase the level of consumer spending. So cutting interest rates increases the rate of growth in the short term.

### Meeting policy objectives – controlling inflation

Lower real interest rates mean an increased quantity of money is demanded which is met by an increase in the money supply. This can lead to inflation. Low real interest rates can also lead to inflationary pressures by increasing demand.

### Meeting policy objectives – controlling the exchange rate

If interest rates in one country are low relative to other countries, international investors will be less inclined to deposit money in that country. This decreases demand for the domestic currency and tends to mean the local currency will weaken against foreign currencies.

## QUESTION 2

*Examiner's comments:*

*Referred to bookwork in Chapter 46. Candidates tended to over-complicate their examples for each method instead of providing the more straightforward examples given in the notes. For example, for the derivatives some very exotic suggestions were made - including trading in derivatives on the company's own shares. Furthermore, under securitisation, a large number of candidates listed issuing catastrophe bonds as an example. This is in fact a risk management and not a capital management tool which demonstrated that candidates have not really grasped the working nature and capital structure of a life company, but were merely quoting bookwork from the wrong section.*

i.

Example: The future profits of the in-force life insurance book can be securitised into a tradeable instrument (like a bond) and issued to the market to raise additional capital. The future cashflow stream generated by the secured assets (future profits of in-force book) is then used to meet the interest and capital payments on the bonds.

Assist with Capital management: There is typically risk transfer as the repayments on the bonds are made only if the future profits emerge. This risk transfer (reduction in risk) should reduce capital requirements.

ii.

Example: Instead of issuing standard debt, the life company can raise capital through issuing subordinated debt in the capital markets. The company issues debt which is guaranteed on a subordinated basis by the provider, i.e. the repayment of the debt is guaranteed only after the policyholders' reasonable expectations have been met.

Assist with Capital management: Essentially this is a method of raising capital that has increased the assets of the provider (by the amount of the debt issued) but, because the repayments rank behind the policyholder liabilities (i.e. are contingent on those liabilities being met), does not increase the liabilities. Therefore, the provider's capital position is improved.

iii.

Example: If the life company is concerned about the impact of a fall in its equity values, it could enter into a contract to protect its equity portfolio falling below a certain level.

Assist with Capital management: If derivatives are used for hedging (as opposed to speculation), then the effect is typically a reduction in overall risk. The example above effectively reduces (or eliminates) the impact of downside risk on its equity portfolio and should therefore require less capital.

### **QUESTION 3**

*Examiner's comments:*

*Most candidates incorrectly assumed that internal management accounts or accounts prepared on a best estimate basis show the true underlying profitability of an insurer.*

Yes, your friend is correct in that the true underlying profitability will differ from what is published in the accounts

This is because many of the factors that determine true profitability are unknown when the accounts are published (and may not even be known for many years afterwards)

All the reserves are estimates

The profits disclosed include adjustments from prior years - which may have been overstated or understated

The profits disclosed are a function of the accounting basis used for those particular accounts. Any change of accounting basis will affect the disclosed profitability but not the true underlying profitability.

How prudent (or not) the disclosure is will affect what is published but not the true underlying profitability

However, that all being said, the published accounts should represent the best possible estimation of the company's financial position

{Maximum 4 marks}

## QUESTION 4

*Examiner's comments:*

*Part i of the question was straightforward bookwork and was poorly answered by insufficiently prepared students. A key mistake made by many students was a failure to appreciate that a group life scheme is almost exclusively compulsory and has a fixed benefit structure, which mitigates almost all anti-selection risks.*

*Part ii of the question required an appreciation of those risk factors which cause a risk rated premium to be higher/lower than the cross subsidised rate. Specifically, smokers have a higher risk than non-smokers. Similar reasoning applies to males/females, older/ younger employees, blue collar/white collar, lower paid/higher paid employees and sicker/healthier employees. A surprisingly high number of students assumed that these benefits continued after retirement.*

i.

People will be more likely to take out contracts when they believe their risk is higher than the insurance company has allowed for in its premium. This is known as anti-selection.

Anti-selection is limited as:

- membership of the scheme is compulsory
- the benefit is a fixed multiple of salary, the risk of over-insurance is removed
- the decision makers will probably have to provide evidence of good health to get the cover

Anti-selection would only occur if people selected to work at the company in order to get access to the benefit. This risk is mitigated to some extent by the recruitment process in that companies don't tend to hire people who are noticeably not healthy. In addition, people not in good health tend not to change jobs.

ii.

As the premium is fixed at 1% of salaries, it means that cross-subsidisation will take place

Older employees will be better off than younger employees as the younger employees are therefore cross-subsidising the older employees. This is because the older you are, the higher the likelihood of dying.

Males will be cross-subsidising females as females have lower expected mortality.

Smokers will be cross-subsidising non-smokers as smokers have higher mortality than non-smokers.

Blue collar workers will be better off than white collar employees. This is because the nature of their work is generally more dangerous.

Lower salaried employees will be better off than higher salaried employees. This is because their standard of living will differ and higher paid employees tend to have better access to medical care.

Sicker employees will be better off than healthy employees. The sicker you are the less likely you will be able to get insurance, so some people might now have access to insurance when they didn't previously. The risk of dying is also higher for sicker vs healthy employees so there is a cross-subsidy built in.

Those without cover currently will benefit in that they get cover very easily with minimal administrative difficulty.

Employees who have risky past-times (eg. Skydiving) will be better off than those who don't. Not only will they pay a lower premium but often these hazardous past-times are excluded on individual policies.

Employees with a salary of R1.25m will benefit in that they won't have to go for medicals to get coverage.

{Maximum 7 marks}

## QUESTION 5

*Examiner's comments:*

- (i) *This question was generally poorly answered. A large number of candidates did not relate underwriting to "potential" risks and also did not appreciate that the question referred to "prospective" risks and described claims underwriting in detail. The question required the application of bookwork from life insurance to a general insurance setting – some candidates however described medical underwriting in detail. Candidates also frequently described characteristics of buildings and contents insurance instead of describing the underwriting thereof.*
- (ii) *This question was generally well answered. Many candidates related the underwriting expense to the cover provided rather than the premium when describing the allowance in pricing.*

i.

Underwriting generally refers to the assessment of potential risks...

...so that each can be charged an appropriate premium (or offered appropriate terms).

- It can protect the provider from anti-selection...

- ...especially cases where the building is particularly exposed to a peril such as fire
- ...or the risk itself is sub-standard in terms of construction type, protection measures etc.
- It will enable a provider to identify risks for which special terms need to be quoted.
- For these sub-standard risks, the underwriting will identify the appropriate special terms to be applied, which may include
  - o Increasing the benefit
  - o Applying an endorsement / exclusion / special terms
  - o Requiring specific risk management, e.g. fire protection.
  - o Declining the cover
  - o Loading the premium
- Adequate risk classification in the process...
- ...will ensure that all risks are rated fairly
- Will ensure that experience does not depart too much from the pricing basis
- ... as well as ensuring that the scope of events and perils covered is adequate
- ... which will be particularly relevant if complex commercial risks such as business interruption is involved
- Will ensure that a client has the appropriate amount of insurance
- To ensure that there is not overinsurance or to be aware that the insured is underinsuring
- Underwriting may also be a requirement if reinsurance is to be placed on this exposure

{ maximum 8 marks }

ii.

### **Nature**

- This can be considered an example of an initial
- And variable expense...
- ...since it should increase with business volumes over time.
- Admittedly, over very short durations it may be viewed as fixed...
- ...since full time staff are likely required to perform this function.
- It is also an example of a direct expense...
- ...since it can clearly be assigned to a specific class (in this case commercial property).

### **Allowing for it**

- It is likely to be priced as a percentage of premium when setting the basis...
- ...but one can also argue to use a fixed amount per contract.
- The latter is likely to be very expensive for smaller risks.
- A combination of the two can also be considered.

## **QUESTION 6**

*Examiner's comments:*

*Part i*

*Candidates listed many reasons to hold reserves. However, they were not always applicable to general insurance. Often the most important reasons were omitted. Many candidates wrote as much for part i (3 marks) as for part ii (10 marks).*

## *Part ii*

*Many stakeholders that were in the notes were listed. However, these were not always applicable in a general insurance context or were not part of the 6 most important stakeholders.*

i.

- There may be time delays between a claim event...
- ...and it being reported to the insurer.
- There may be a delay between reporting and eventually settling/finalizing the claim...
- ...which also introduces uncertainty as to what the ultimate amount of the claim will be.
- These claims reserves constitute a liability to the company...
- ...and quantifying it is required to know the solvency position of the company.
- The accruals principle of accounting...
- ...requires that claims are recognized and provided for in the period in which they occur.
- This will further enable the company to ensure it can meet all existing future liabilities.

ii.

### **Shareholders of the company**

- Cannot be sure of the solvency position of the company...
- ...since claims reserves form part of liabilities on the balance sheet
- Cannot be sure of the profitability / performance of the company...
- ...since movements of claim reserves flow through the income statement.
- May affect dividend payments if substantial reserves have to be set up

### **Clients and/or brokers of the company**

- May be worried whether past claims will be settled...
- ...especially in the case of long-tailed liability type exposure.
- Will required decisions on whether to move future cover to another carrier.

### **Tax authority**

- Since movement of claim reserves flow through the income statement...
- ...they would be interested to know whether there was an overstatement of reserves...
- ...to delay paying taxes.

### **Regulator**

- They are interested in the solvency of the company...
- ...to protect the consumers and insurance industry from risk of company failure
- Would want to understand how they can detect similar irregularities in future.

## **Professional Accounting and/or Actuarial Bodies/Associations (or Auditor)**

- To what extent their members were involved with this conduct...
- ...whether any action e.g. disciplinary etc. would be required.
- How similar mistakes can be avoided in the future.
- How does this affect their credibility / reputation

## **Other insurance companies**

- Will revisit their processes to make sure they comply
- Might present opportunities to gain market share and/or staff.

## **Staff**

- Can expect an increase in uncertainty (or negativity) among staff
- Which may lead to people moving on to other companies
- Possible dismissal or resignation of key people.

## **QUESTION 7**

*Examiner's comments:*

*i) Generally, well answered. Most students performed well on this part of the question although few managed to score the full marks as most students did not generate sufficient points for the number of marks.*

*ii) Most students realized that underwriting would be difficult given that no data exists but provided suitable underwriting factors to consider.*

*It was concerning that a lot of students still wanted to obtain details about the owner of the vehicle where this will have no impact on the risk for a driver-less vehicle.*

*There were a number of marks available for this question and it was disappointing to not see more students getting full marks.*

*iii) This part proved to be the toughest part of the question. Easy marks were awarded for providing the formula for the Office Premium.*

*Many students wasted time explaining the type of model to use, running and testing of this model which did not answer the question so were not awarded any marks for this.*

*Many students correctly identified that data for the Risk Premium would be the biggest hurdle and it was disappointing that some students suggested using industry data or even reinsurance data.*

i.

- fire
- accidental damage (with another vehicle or falling trees)
- damage from adverse weather conditions (hail, lightening, flood)
- theft
- hi-jacking (though might be difficult to do for a driverless car) or cyber-jacking (only award one half mark for this)
- 3<sup>rd</sup> party liability (if car causes damage to another person's property or to another person)
- mechanical/electrical/technical breakdown
- product liability (covering the manufacturer against a fault in the vehicle)

ii.

Most likely no underwriting will be possible. There will be no statistics on accidents with driverless cars and nothing that you could underwrite for is likely to influence the risk.

For product liability, you might consider the past claims against the manufacturer though even this is unlikely to be a good indicator of the risk for a driverless car.

Might be possible to underwrite for weather patterns in a particular geographical area which could affect the risk of damage from adverse weather.

Might be possible to underwrite for the density of traffic based on where the policyholder live which affects the likelihood of accidents

For theft, might consider where the car is kept when not in use or the insurer could insist on some form of electronic tracking to be enabled

Could possibly decline certain brands if the technology is deemed to be unreliable

iii.

Office premium is calculated by taking the risk premium and then allowing for loadings for tax , commission , expenses , profit , contingencies , investment income and the cost of reinsurance.

Risk premium = expected claim frequency x expected cost of claim (allowing for discounting of claims if necessary)

Difficulty is that you don't know either the expected claim frequency or the expected claim cost for any of the events.

Other places in the world might be more advanced in these covers and so there might be data from elsewhere in the world that you could use.

You could ask a reinsurer for assistance with setting the risk premium (though they too might not have statistics)

**(note to marker:** no marks should be awarded for suggesting you could use industry statistics)

Whatever you use, you will definitely want to ensure you have an explicit safety margin built in to the risk premium.

If you don't have an explicit margin built into the risk premium, you might seek a higher profit and/or contingency loading to allow for the extra uncertainty.

The other items (commission, expenses, cost of reinsurance & investment income) should be known costs and can be loaded into the premium rates.

## QUESTION 8

*Examiner's comments:*

*The first part of this question was a bookwork question and was answered well by most candidates.*

*Many students struggled with the second part of this question, i.e. how to explain the application of the Actuarial Control Cycle in a practical scenario. The candidates that performed well with this question displayed a good understanding of the scenario and applied the principles by following the basic steps of the Actuarial Control Cycle.*

i.

### Potential Attractions

- Rapid economic growth
- Better diversification
- Inefficient markets: buy cheaply
- Perceived to be risky: buy cheaply
- Might offer industries to invest in that are not available elsewhere
- If you have liabilities in that market you can match them with assets from that market

### Potential Drawbacks

- Lack of quality information – requires local expertise
- Poor regulation of the stock market
- High levels of volatility
- Tight controls on ownership by foreigners
- Repatriation problems

- Might not have double-taxation agreements with your country and therefore cannot recover withholding taxes

ii.

### General economic and commercial environment

A thorough understanding of the relevant emerging markets will be required in order to assess the impact of this proposal. The attractions and drawbacks should clearly be understood and articulated for each of the countries considered. This will include an understanding of the economic, political, tax, regulatory, legislative and commercial climate in each of the countries considered. The risk and return characteristics of the asset classes considered will also be investigated, including the correlation of returns between asset classes, and relative to those in the local country.

### Specifying the problem

The main problem to solve is that the investment portfolio should be adjusted to introduce exposure to the emerging markets in such a way that it

- Continues to match the liabilities of the company ;
- Potentially increase the overall expected return ;
- Yet remain within the risk limits required by the portfolio.

The main stakeholders that are affected are the shareholders, and potentially policyholders if with-profits or unit-linked business is present. The risk appetite of shareholders will therefore need to be taken into account, especially the additional risks that emerging markets will introduce, although the diversification benefits might negate this to some degree. On the other, policyholders' reasonable expectations (created by marketing literature, mandates, etc.) should also be considered in this context.

By introducing emerging markets into the portfolio (additional investment), one should also consider from which asset classes (or markets) should be disinvested in the bigger portfolio.

### Developing the solution

The development of the solution will include a modelling exercise to ensure that the criteria and considerations highlighted above are taken into account. The model (most likely stochastic) will need to incorporate the additional return and risk characteristics that emerging markets will introduce, and the impact thereof on the full investment portfolio. It is therefore important to also include the correlation of the newly introduced asset classes relative to other asset classes in the investment portfolio as part of the model.

The model will aim to project future asset and liability values under a range of scenarios considered in order to assess which level of emerging market exposure will ensure that the success criteria for the project has been achieved. Ultimately the most optimal solution will be considered for implementation,

and a responsible implementation plan should be considered taking current market conditions into account.

### Monitoring the experience

Once the proposed solution has been implemented, it will become necessary to continuously monitor the experience - actual returns and corresponding volatility/risk - of the portfolio and compare this to the expected experience. If experience differs materially from the expected and the impact on the success criteria, then this should be fed back to the problem specification and solution development to ascertain whether updated exposure limits should be considered.

### Professionalism

It should be considered whether I have the necessary knowledge and skills for emerging market decisions and proposals. If not, then it might be required to bring in expertise – either internally or externally.

The impact on all stakeholders should also be considered and balanced at all times.

Where relevant, professional guidance notes and regulations should be consulted and followed at all times.

## **QUESTION 9**

### *Examiner's comments:*

*This question was answered reasonably well. Most candidates managed to follow a systematic approach to the structure of their answer (using SYSTEMT as framework), and therefore scored reasonably well. The majority of the marks were available for the discussion of the yield aspect of the investment - especially given the unique feature of the bond - and stronger candidates focused a fair amount of effort around this topic. Weaker candidates managed to provide very high-level comments under each characteristic, or randomly commented on certain aspects without a SYSTEMT structure in mind. A few candidates did not take the unique feature into account (and as a consequence lost out on a number of marks), or did not comment on the appropriateness of the asset (as requested in the question).*

### Cashflow pattern

An initial purchase amount will be paid in return for regular coupon payments and a redemption value, all of which are linked to an inflation index. However, during a recession, no coupon payments will be payable. This is exactly the opposite of what one generally wants from a bond investment

### Security

Bonds issued by a reputable government offer absolute monetary security of both income and capital. There is virtually no risk of default. However, these are issued by a local (provincial) authority and

therefore are less secure than one issued by the national government. The national government might, however, stand in on any potential default.

### Yield – running yields

Historically, running yields on conventional bonds have typically been higher than running yields on equities and property. This is because income on equities and property is expected to grow over time, creating capital gains. Conversely, since the income stream on a conventional bond is flat and the scope for capital gains is limited (if the bond is held to maturity), income levels tend to be higher. This bond's unique feature will affect the running yield in that no coupons will be payable during recession times. For longer-term bonds, this might materially affect the expected yield.

*Appropriateness for investment portfolio: The nature of the liability is typically to provide a regular income to beneficiary of the policy when the risk materialised, and one would expect this to increase in line with inflation over time. An ideal asset match would therefore require regular inflation-linked payments. Although the bond's coupon payments do provide this, it is not ideal that no coupons are payable during a recession. In fact, one can expect unemployment to rise during a recession, which therefore means that this bond is a poor match during this time.*

### Yield – real vs nominal

The actual payments from an index-linked bond are dependent on future inflation. In practice the operation of an index-linked security will be such that the cashflows do not relate to the inflation index at the time of payment, due to delays in calculating the index. Although the bond will largely track inflation, the fact that no coupons are payable during a recession, one can expect the expected yield to be structurally lower.

*Appropriateness for investment portfolio: The fact that coupons (and redemption value) are inflation-linked does imply it might be a reasonable match for the nature of the liability. The choice of inflation index being tracked might also affected the appropriateness of the investment.*

### Yield – expected return relative to other assets

Low risk/low return – conventionally, it might be argued that the low risks associated with conventional government bonds should lead to a low expected return. This argument is sound if you ignore the risk of erosion of real return by high inflation. The historical evidence tends to support the idea that returns from government bonds are generally lower than returns from equities.

*Appropriateness for investment portfolio: Given that the yield on this bond will be lower if compared to other asset classes (some of which might also be appropriate for the liability), it might be necessary to understand the impact on the pricing of the product and the competitiveness thereof. Generally speaking, a lower expected return might result in higher expected premiums.*

### Spread – volatility of capital values

Market values will fluctuate from day to day if there are changes in the supply and/or demand. Quite large shifts in market value are possible with less liquid, long-dated stocks. Note that for index-linked bonds, it is a fall in real yields not nominal yields that increases prices.

### Term

Various terms can be obtained, ranging from short dated (less than 5 years) to undated.

*Appropriateness for investment portfolio: The relevance of this will depend on the term of the bond (not provided). Ideally one would want to match the term of the liability and the term of the asset.*

### Expenses

Dealing costs are usually very low – the margins between buying and selling prices being narrower than for corporate bonds.

### Exchange rate – currency risk

This is not relevant as the bond is issued by the local government.

*Appropriateness for investment portfolio: Since the bond is locally issued, it should provide a reasonable match for the currency nature of the liability.*

### Marketability

Government bonds typically have excellent marketability. Investors can deal in large quantities with little (or no) impact on the price.

### Tax

The taxation of the income and capital gains will depend on the tax regime of the country concerned.